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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/616,606	07/14/2000	Douglas P. Hart	0050.2015-000	6151

959 7590 06/15/2005

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BOSTON, MA 02109

EXAMINER

MACKOWEY, ANTHONY M

ART UNIT	PAPER NUMBER
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2623

DATE MAILED: 06/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/616,606	HART, DOUGLAS P.	
	Examiner	Art Unit	
	Anthony Mackowey	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 February 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 5-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 5-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 July 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>2/22/2005</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114 was filed in this application after appeal to the Board of Patent Appeals and Interferences, but prior to a decision on the appeal. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on February 14, 2005 has been entered.

Response to Amendment

2. The Declaration under 37 CFR 1.132 filed February 14, 2005 has been considered but is moot in view of the new ground(s) of rejection.

Response to Arguments

3. Applicant's arguments with respect to claims 1, 2 and 5-20 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 2, 5-11, 13, 14, 16, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsueh et al. ("Real-time 3D topography by speckle image correlation" cited on applicant's IDS), hereafter Hsueh, in view of Bacs Jr. (USPN 5,699,112), hereafter Bacs.

6. Regarding claims 1 and 7, Hsueh discloses an imaging system and method for imaging a target in three dimensions (abstract), the system and method comprising: a light projection source (laser speckle generator) for projecting a beam of light onto the target; an image acquisition subsystem (CCD cameras) for acquiring at least two images from light reflected by the target through a lens, an aperture element and a camera disposed along an optical axis (page 1, last paragraph to page 2, first paragraph); and a correlation processor for processing the acquired images according to a sparse array image correlation process (page 2, second paragraph). Hsueh does not disclose that the image acquisition subsystem comprises a moveable aperture.

7. Bacs discloses an apparatus for three-dimensional imaging wherein the image acquisition subsystem further includes a moveable aperture element (col. 4, lines 56-59, FIGS. 1 and 2, an actuator or motor which operates to move aperture in parallax scanning motion relative to lens optical axis). It would have been obvious to one of ordinary skill in the art at the time the invention was made to sequentially acquire at least two images from different angles using a moveable aperture element as taught by Bacs in order to generate a three-dimensional model of an object using a single camera without having to move the camera to different image capture positions and without having to use two cameras, thus avoiding mismatches, resulting in a more stable image (col. 2, lines 8-14 and 47-54).

8. Regarding claims 2 and 8, Bacs discloses that the image acquisition subsystem comprises a lens, an aperture element and a camera disposed along an optical axis (FIGS. 1 and 2) and wherein the aperture element defines an opening offset from the optical axis (FIGS. 1 and 2, The aperture 30 is offset from the optical axis 25.) and the image acquisition subsystem further includes rotation means for rotating the aperture element about the optical axis (col. 4, lines 56-59, an actuator or motor; FIG. 1, Scanning pattern 36 clearly shows rotation about the axis.) such that the at least two images are acquired sequentially from different angles (col. 5, lines 7-27).

9. Regarding claim 5, Bacs discloses that the image acquisition subsystem comprises a lens, an aperture element and a camera disposed along an optical axis and wherein the camera includes a single CCD element (FIGS. 1 and 2; col. 4, lines 40-43).

10. Regarding claims 6 and 9, Hsueh discloses that the light projection source includes a diffuser for projecting a beam of light having a random pattern (page 1, last paragraph to page 2, first paragraph).

11. Regarding claims 10 and 16, in an imaging system having a lens, an aperture element and a camera disposed along an optical axis (inherent), Hsueh discloses an imaging method and system for imaging a target in three dimensions (abstract), the method and system comprising: a light projection source for projecting a beam of light onto the target; an image acquisition subsystem for acquiring at least a first and second image at the camera from light reflected by the target through the lens (page 1, last paragraph to page 2, first paragraph); and a correlation processor for processing the acquired images according to an image correlation process to resolve three dimensional components of the target (page 2, second paragraph). Hsueh does not disclose that the aperture element defines an opening offset from the optical axis and the image

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acquisition subsystem further includes rotation means for rotating the aperture element about the optical axis such that an opening of the aperture element offset from the optical axis is set to first and second positions and the at least two images are acquired at the CCD element sequentially from different angles.

12. Bacs discloses apparatus for three-dimensional imaging wherein the aperture element includes an opening offset from the optical axis (FIGS. 1 and 2, The aperture 30 is offset from the optical axis 25) and the image acquisition subsystem further includes rotation means for rotating the aperture element about the optical axis (col. 4, lines 56-59; FIG. 1) such that the at least two images are acquired at the CCD element (col. 4, lines 40-43) sequentially from different angles (col. 5, lines 7-27; see above discussion of claims 1 and 7).

13. Regarding claim 11, Hsueh discloses that the processing includes processing the acquired images according to a sparse array image correlation process (page 2, second paragraph).

14. Regarding claims 13 and 18, Hsueh discloses that the processing further includes recursive (iterative) correlation (page 2, paragraphs 4-6).

15. Regarding claims 14 and 19, Hsueh discloses that the correlation processor provides correlation error correction (page 2, paragraphs 4-6).

16. Claims 12, 15, 17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsueh in view of Bacs as applied to claims 11, 14 and 16 above, and further in view of Hart (USPN 5,850,485, cited on applicant's IDS).

17. Regarding claims 12 and 17, Hsueh discloses processing of the acquired images according to a sparse array image correlation process which comprises forming first and second

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image arrays of pixel values from respective first and second images, each pixel value associated with one of a number of pixels, and performing a correlation process on the selected pixel values comprising creating first and second sparse image arrays of the selected pixel values and their locations in the respective first and second image arrays, performing individual correlations successively between pixel entries of the first sparse image array and pixel entries of the second sparse image array within a pixel distance of each other, and cumulating the correlations in a correlation table at respective distance entries (page 2, second paragraph to last paragraph).

Hsueh does not explicitly disclose selecting pixel values in the image arrays which are beyond a pixel threshold value. Hart discloses sparse array image correlation wherein a threshold level is set and only the pixel values that exceed the threshold level are retained in a sparse image array (column 6, line 2-8). It would have been obvious to one of ordinary skill in the art at the time the invention was made to select pixel values in the image arrays beyond a pixel threshold value as taught by Hart in order to avoid processing pixels having a value below the threshold to speed overall processing (column 7, line 15-23).

18. Regarding claims 15 and 20, Hart discloses that the correlation processor provides sub-pixel resolution processing (column 5, line 42-54; column 8, line 61-65). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide sub-pixel resolution processing as taught by Hart in order to improve accuracy while increasing processing speed (column 1, line 58-column 2, line 9).

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Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Mackowey whose telephone number is (571) 272-7425. The examiner can normally be reached on M-F 9:00-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (571) 272-7414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AM

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6/3/2005


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